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**EMBOSS ED SPACER FILM FOR FILM CARRIERS**

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**EMBOSSSED SPACER FILM FOR FILM CARRIERS**

[Firumu kyaria-yo enbosu supeesa firumu]

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[There are no amendments to this patent.]

**Claims**

1. An embossed spacer film for film carriers characterized in that in an embossed spacer film for film carriers having protrusions which are created alternately on either side of a long flexible plastic film along either edge part of the film by means of embossing, and the tip parts of the aforementioned protrusions are made into a roughly flat oblong shape.
2. The embossed spacer film for film carriers described under Claim 1, characterized in that the length of the tip part of the aforementioned protrusion in the length direction of said film is greater than the length of a film feeding sprocket hole created on the film carrier.

## Detailed explanation of the invention

### Industrial application field

The present invention pertains to an embossed spacer film for film carriers used for the production, storage, and installation steps of a film carrier for a semiconductor device. In particular, it pertains to an embossed spacer film for film carriers which is free from deformation at a sprocket hole part of the film carrier and a drop in the planarity of the overall film carrier.

### Prior art

In recent years, a film carrier system has been utilized vigorously during the mounting of a semiconductor, such as an IC, as a method suitable for reducing the thickness of the package, increasing the number of pins, and achieving automated assembly. In the case of the film carrier system, sprocket holes for film feeding and device holes for assigning elements are created on a normal polyamide insulator film, a lead pattern is formed by means of a photoetching method after a copper foil is pasted via an adhesive in order to create a film carrier.

Because said lead pattern is minute, and inner leads for joining elements and outer leads for external connections in particular are formed so as to protrude inside device holes created on the film, it is deformed easily by slight external force. Therefore, in order to avoid the aforementioned deformation of the lead pattern, as well as to keep film carriers from coming into contact with each other during the film carrier production step, the storage step, and the semiconductor assembling step, it is common practice to wind [film carriers] onto a reel while laying a film spacer created by creating protrusions along either edge part of a film and on either side of the film alternately by means of embossing between them when handling them. At this time, because the contacts between the spacer film and the film carriers are restricted to only the protrusion parts created on the spacer film by means of embossing and the parts where the sprocket parts are formed on the film carriers, not only can the film carriers be prevented from coming into contact with each other, but the lead pattern formed on the carrier film can also be prevented from coming into contact with the spacer film, in order to avoid deformation of and damage to the lead pattern, which would occur when contact is made.

### Problems to be solved by the invention

However, although contact-related deformation and external damage were able to be prevented using the embossed protrusions of the conventional embossed spacer film for film carriers, because the embossed protrusions were semispherical, the pressure applied to the spacer films in contact with either side of the film carrier was concentrated at the tip parts of the embossed protrusions. Thus, when a high level of tension was applied during the winding, for example, there was the risk that the sprocket parts of the film carrier might be deformed by the

semispherical protrusions. In addition, there was a problem that the overall planarity of the film carrier, including the lead pattern, deteriorated due to the pressure concentration, resulting in harmful effects, such as a drop in the accuracy of positioning with the sprockets and a drop in the accuracy of pattern recognition.

Therefore, the purpose of the present invention is to present an embossed spacer film for film carriers that is free from a deformation of the sprocket hole and a drop in the planarity of the film carrier.

#### Means to solve the problems

In order to achieve the aforementioned objective, the present invention presents an embossed spacer film for film carriers in which the tip parts of the protrusions are made into a roughly flat, oblong shape, and the length of their tip parts is made greater than the length of the sprocket holes created on the film carrier.

That is, in the embossed spacer film for film carriers of the present invention, the embossed protrusions formed on the spacer film are made into a roughly flat, oblong shape so as to eliminate the concentration of stress in order to prevent a concentration-related drop in the planarity, and the tip parts are made longer than the sprocket holes on the film carrier so as to eliminate the deformation of sprocket holes that would occur when the protrusions fall into the sprocket holes.

Any plastic film may be used as a film material for the embossed spacer film for film carriers of the present invention, provided that it can be embossed by applying heat and pressure to it, and that it never contaminates the film carrier. Thermoplastic films, such as a polyester resin, a polyethylene resin, a polypropylene resin, and a polyvinyl chloride resin, are particularly preferable. In addition, antistatic measures, such as the use of a conductive filler or the formulation of an antistatic agent, may be taken in order to prevent the adhesion of foreign matter due to electrostatic charges and electrostatic breakdown.

The embossed spacer film for film carriers of the present invention will be explained in detail below.

#### Application example

Figures 1(a), (b), and (c) show an application example of the embossed spacer film for film carriers of the present invention. 1.2 mm high protrusions 10 with flat oblong peak parts 10a (3 mm long and 2 mm high) were formed along either edge part of a 35 mm wide 0.18 mm thick long polyethylene terephthalate film on either side of the film, alternately by means of thermal pressing in order to create spacer film 1 for film carriers. Although peak part 10a was decided to be 3 mm in length, in general, as shown in (c), said length L is greater than length l of sprocket

hole 3a of film carrier 3. On the other hand, as a comparative example, as shown in Figures 2(a) and (b), 1.2 mm high semispherical protrusions 20 with the bottom diameter of 4 mm were formed on a similar polyethylene terephthalate film using the same method, in order to create embossed spacer film 2 for film carriers.

After polyethylene terephthalate film 1 (application example) and polyethylene terephthalate film 2 (comparative example) created in said manner were wound respectively onto a reel together with film carriers 3 each having 1.981 mm sprocket holes created at either edge part of a 35 mm wide 75 mm thick polyimide film alternately as shown in Figure 3 and Figure 4 respectively at the winding tension of 1 kg f and stored under the normal temperature and moisture for one month, the deformation conditions of respective film carriers were examined.

As a result, in the case of embossed spacer film 2 for film carriers of the comparative example, dent-like deformations of approximately 0.5 mm were observed at the polyimide film parts in contact with protrusions 20, and that occurrences of swells were observed at the lead pattern part of film carrier 3; whereas, in the case of embossed spacer film 1 for film carriers of the application example, deformation of the polyimide film was equal to or less than 0.1 mm, and no swelling was observed at the lead pattern part.

#### Effect of the invention

As explained above, according to the embossed spacer film for film carriers of the present invention, because the tip parts of the protrusions are made into a roughly flat, oblong shape, and the length is made greater than that of the sprocket hole on the film carrier, a deformation of the sprocket hole and a drop in the planarity of the film carrier preventable.

#### Brief description of the figures

Figure 1(a) and (b) show an application example of the embossed spacer film for film carriers of the present invention; wherein, (a) of said figure is a partial plan view, and (b) of said figure is a cross-sectional view along the A-A line. Figure 1(c) is a cross-sectional view showing the relationship between the embossed spacer film for film carriers and the film carrier of the present invention. Figures 2(a) and (b) show an embossed spacer film for film carriers as a comparative example; wherein, (a) of said figure is a partial plan view, and (b) of said figure is a cross-sectional view along the B-B line. Figure 3 is a cross-sectional schematic view showing the condition in which film carriers are wound along with the embossed spacer film for film carriers of the present invention. Figure 4 is a cross-sectional schematic view showing the condition in which film carriers are wound along with the embossed spacer film for film carriers of the comparative example.

### Explanation of symbols

- 1 Embossed spacer film for film carriers
- 10 Quasi-oblong protrusion
- 10a Peak part of protrusion
- 2 Embossed spacer film for film carriers
- 20 Semispherical protrusion
- 3 Film carrier
- 3a Sprocket

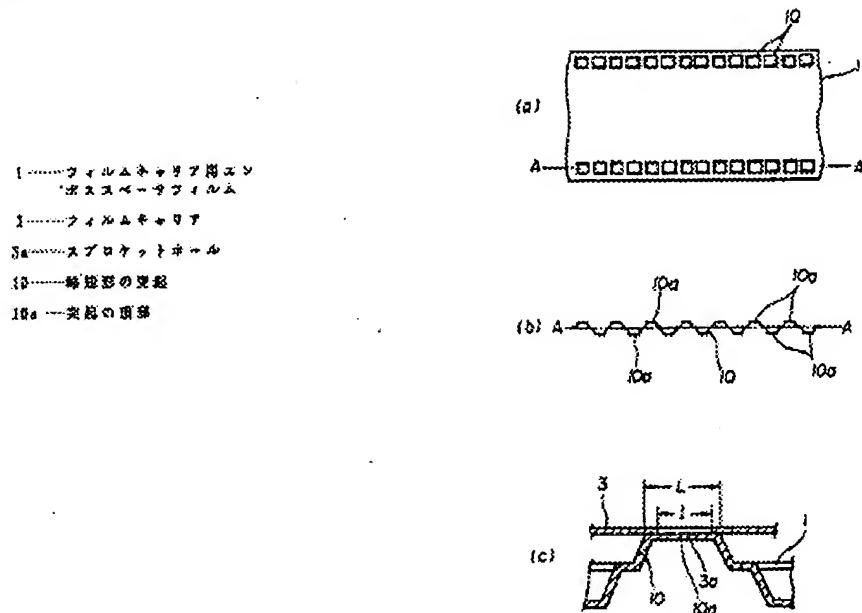


Figure 1

Key:

- 1 Embossed spacer film for film carriers
- 3 Film carrier
- 3a Sprocket hole
- 10 Quasi-oblong protrusion
- 10a Peak part of protrusion

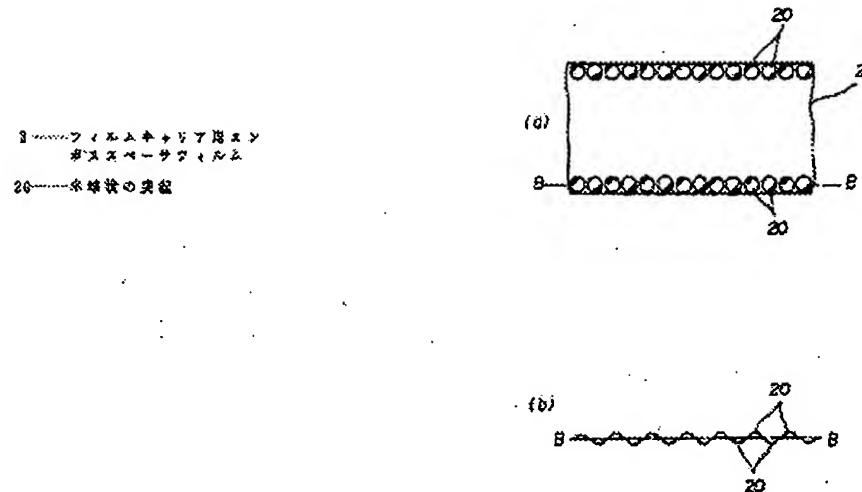


Figure 2

Key: 2 Embossed spacer film for film carriers  
20 Semispherical protrusion

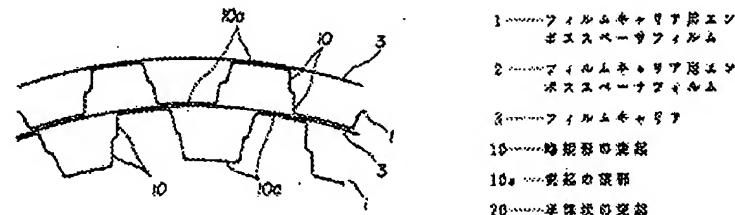


Figure 3

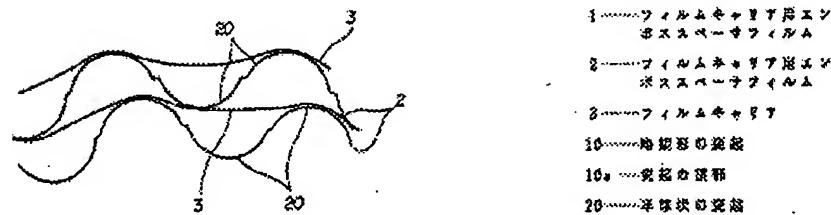


Figure 4

Key: 1 Embossed spacer film for film carriers  
2 Embossed spacer film for film carriers  
3 Film carrier  
10 Quasi-oblong protrusion  
10a Peak part of protrusion  
20 Semispherical protrusion